

Research Article

Effectiveness of Jacobson's Muscle Relaxation Technique and Deep Breathing Exercise on Stress among Physiotherapy Final Year Students

M Shivamani¹, K C Gayathri², T Muthu Raj³, M Manova⁴, P Senthil⁵

^{1,3,4}Final year UG student, ²Assistant Professor, ⁵Dean, Chettinad School of Physiotherapy (CSP), Chettinad Hospital and Research Institute (CHRI), Chettinad Academy of Research and Education (CARE) Kelambakkam, Tamil Nadu, India.

DOI: <https://doi.org/10.24321/2455.9199.202404>

I N F O

Corresponding Author:

K C Gayathri, Chettinad School of Physiotherapy (CSP), Chettinad Hospital and Research Institute (CHRI), Chettinad Academy of Research and Education (CARE) Kelambakkam, Tamil Nadu, India.

E-mail Id:

gaybhava@gmail.com

Orcid Id:

<https://orcid.org/0000000298338290>

How to cite this article:

Shivamani M M, Gayathri K C, Raj T M, Manova M, Senthil P. Effectiveness of Jacobson's Muscle Relaxation Technique and Deep Breathing Exercise on Stress among Physiotherapy Final Year Students. *Int. J. HealthCare Edu. & Med. Inform.* 2024;11(1&2):18-22.

Date of Submission: 2024-02-18

Date of Acceptance: 2024-03-21

A B S T R A C T

Introduction: Stress is a common response to demanding situations, significantly impacting mental and physical health if not properly managed. Jacobson's Muscle Relaxation Technique (JMRT) is a type of therapy that focuses on tightening and relaxing specific muscle groups in sequence. Deep breathing exercises involve slow, deep inhalations and exhalations to promote relaxation and reduce stress. Depression Anxiety Stress Scale (DASS-21) is a 21-item questionnaire assessing depression, anxiety, and stress symptoms, used for psychological evaluation and research.

Method: This is an experimental study where two intervention techniques were applied in a single group consisting of a total of 30 subjects. The comparative analysis of the pre-test and post-test interventions was based on the DASS-21 scale.

Results: The pre-test DASS-21 scores averaged 25.55 with a standard deviation of 6.23, indicating a high-stress level among the students. Following the intervention, post-test scores significantly decreased to an average of 13.77 with a standard deviation of 3.10. This substantial reduction in stress levels was statistically validated, with a t value of 12.19 and a significance level of $p \leq 0.001$, demonstrating an extremely significant difference between pre-test and post-test scores.

Conclusion: This study demonstrates that JMRT and deep breathing exercises are effective interventions for reducing stress among final-year physiotherapy students, as evidenced by the significant decrease in DASS-21 scores post-intervention.

Keywords: DASS-21, Deep Breathing Exercises, Jacobson's Muscle Relaxation Techniques, Final Year Physiotherapy Students, Stress

Introduction

Stress is a significant barrier to students' ability to focus, solve problems, and make decisions.¹ It can lead to

symptoms like anxiety and depression and is often referred to as the "disease of civilisation". Stress results from conflicts between individuals and their external environment,

triggering the body's fight-or-flight reaction through the release of hormones like cortisone and adrenaline.² Several factors contribute to stress levels, including physical health, quality of interpersonal relationships, responsibilities, societal expectations, and support systems.³ Frequent life changes or tragic events also play crucial roles in stress levels. Globally, psychological morbidities are prevalent, with depression expected to become the leading cause of disease by 2030.⁴ Depression is marked by melancholy, loss of interest, guilt, sleep disturbances, fatigue, and difficulty concentrating. A study by the World Health Organization (WHO) found that around 10–20% of adolescents globally experience mental health conditions, with stress being a common issue among them.⁵ A study published in the *Journal of Adolescent Health* reported that approximately 30–40% of adolescents in school experience moderate to severe academic stress.⁶ The American Psychological Association (APA) highlights that about 20% of adolescents report high levels of stress due to social issues and peer relationships.⁷ According to a study in the *Journal of Child and Family Studies*, about 25–30% of adolescents report significant stress due to family-related issues.⁸ A study in the *Journal of Adolescence* found that around 35% of adolescent girls reported high stress levels compared to 20% of boys.⁹

Stress involves a perceived threat to well-being, activating the body's stress system, which includes physiological and behavioural adaptations to restore homeostasis. It can have both positive and negative emotional and physical effects. Excessive stress disrupts students' functioning, potentially leading to psychological morbidity, diminished quality of life, reduced self-esteem, and academic challenges.

Students face academic pressures, social adjustments, competition for grades, financial worries, and uncertainty about the future. These stressors impact their mental and physical health, academic performance, and daily functioning. Moderate stress levels are linked to anxiety, while high-stress levels correlate with depression. Anxiety is characterised by fear and apprehension, and anxiety disorders involve intense feelings of worry and fear.

Chronic stress and anxiety can alter behaviour and emotional processing, leading to long-term consequences if not addressed. Major depression is a severe condition affecting emotional state, physical health, and daily functioning. In India, an estimated 57 million people suffer from depression, but stigma and lack of access to treatment are significant barriers. Most depression cases are treatable with affordable therapies, yet many individuals do not receive the necessary care.

Understanding the psychological aspects of health is crucial for physiotherapists, who spend significant time with patients. Addressing students' mental health can

create a healthier workforce that prioritises well-being. Stress triggers the body's fight-or-flight reaction, releasing hormones like adrenaline and cortisol, which prepare the body to face danger by increasing heart rate, redirecting blood flow to muscles, and enhancing glucose utilisation. The hypothalamus communicates with the adrenal glands to release these hormones, aiming to boost survival chances.

Adrenaline's effects include rapid heartbeat, increased breathing, muscle glucose utilisation, and blood vessel constriction. Chronic stress, however, can harm health, highlighting the importance of managing stress effectively.¹⁰ Anxiety and despair are two indicators of stress that are lessened by the Japanese pressure point relaxation technique (JPMR), which focuses on sequentially tightening and relaxing particular muscle groups.¹¹ Many people also find that slow breathing reduces stress and boosts their antioxidant status, making it a useful relaxing strategy. Jacobson's Muscle Relaxation Technique (JMRT) involves systematically tensing and then relaxing different muscle groups in the body.¹² By focusing on the contrast between tension and relaxation, individuals can achieve deeper physical relaxation and reduce stress. The technique is typically practised in a quiet environment, with participants concentrating on their breathing and bodily sensations. JMRT is widely used in clinical and therapeutic settings to manage stress, anxiety, insomnia, and various psychosomatic conditions.¹³

Breathing exercises, the diaphragm when inhaling, allow the lungs to expand and fill with air more efficiently. It improves oxygen exchange, lowers heart rate, and reduces blood pressure. It is commonly used in practices such as yoga, meditation, and stress management programmes significantly impact students' mental health by reducing stress and anxiety, enhancing focus, and promoting emotional well-being, which in turn contributes to improved academic performance. Addressing stress and its contributing factors is essential for improving students' well-being and creating a supportive educational environment to improve the students academic performance .

The DASS-21 is a shortened version of the Depression Anxiety Stress Scale (DASS), consisting of 21 self-report items designed to measure the emotional states of depression, anxiety, and stress.¹⁴ It provides a quantitative measure of distress along the three dimensions, making it useful for clinical and research settings to assess and monitor the severity of these negative emotional states in individuals.

Materials and Method

Study Design

It is experimental research, where the two interventional techniques were applied to a single group to determine the effectiveness of reducing stress levels among Final

Year Physiotherapy students. The study was done from March 2024 to May 2024 and it was ethically accepted by the Institutional Human Ethics Committee for Student Research (IHEC-1/2392/23).

A total of 30 subjects were selected for this study on the basis of selection criteria. The goal and purpose of the project were described to all subjects and informed consent forms were obtained from each subject.

The DASS-21 served as the basis for the comparison of the pre-test and post-test interventions.

Study Setting

Subjects were selected from the Chettinad School of Physiotherapy at Kelambakkam, Chengalpattu, Tamil Nadu.

Study Duration

The total study period of this study is 3 months and the treatment duration is about 2 weeks.

Study Sampling

A convenient sampling technique was used and the study was conducted in the Chettinad School of Physiotherapy in Kelambakkam, Chengalpattu, Tamil Nadu.

Inclusion Criteria

- **Age:** 20–23 years
- **Gender:** Both
- **Moderate stress:** 19–25 on DASS-21
- **BMI:** More than 25

Exclusion Criteria

- Previous history of psychiatric problems
- Respiratory problem
- Non-cooperative students
- Sleeping time of less than 8 hours

Procedure

Every participant in the study provided written informed consent, and 30 participants were chosen using a convenient sample technique. The subjects were informed about the process, objectives, purpose, advantages, dangers, and results of the investigations in their native tongue. All the subjects underwent pretest and post-test assessment that is before and after the intervention using DASS Scale.

DASS Scale

Pre-Test

Assessed By using DASS-21 Scale (onle Stress Compornent) DASS-21 scale (only stress component)

Intervention

The subjects were asked to do deep breathing exercises and Jacobson's progressive muscle relaxation techniques for 2 weeks (deep breathing exercises for 20 minutes and Jacobson's muscle relaxation techniques for 20 minutes).

Treatment Duration

- **Total duration of exercise:** 2 weeks
- **Duration of exercises per day:** 40 minutes (deep breathing exercises along with Jacobson's progressive muscle relaxation)
- **Deep breathing exercises:** 20 minutes per day
- **Jacobson's muscle relaxation:** 20 minutes per day

Deep breathing exercises included exercises like diaphragmatic breathing, pursed lip breathing, alternate nostril breathing, 4-7-8 breathing technique, and equal breathing.¹⁵

Jacobson's Muscle Relaxation Technique¹⁶

This technique is as follows:

First, take a comfortable position. Clench the right fist. Clench the left fist. Clench both fists at a time. Clench the fist and bend the arms. Straighten the hand. Wrinkle the forehead. Wrinkle the eyebrows. Bite the teeth tightly. Bend the head forward. Bend the head backwards. Bend the shoulders upward. Bend the shoulders backwards. Take a deep breath and expand the chest. Swell the belly with air. Shrink the belly. Bend the lower back. Tighten the thigh muscles. Tighten the calf muscles. Bend the toes upward. Bend the toes downwards. Slowly take a deep breath.

Post-Test

By Using the DASS-21 scale focusing specifically on the stress subscale, to assess the levels of stress experienced by participants after the intervention (only stress)

Statistical Analysis

We tabulated and analysed the collection data using both descriptive and inferential statistics. SPSS version 24, a statistical program for social service, was utilised. A 95% confidence interval was set for every analysis, and a threshold of significance of $p < 0.05$ was employed. The Shapiro-Wilk test was utilised to evaluate the normality of data. (Table 1), (Table 2)

Results

The results of this investigation (Shapiro-Wilk test) showed that the dependent values, like DASS-21, had regularly distributed statistically significant difference (12.19) at $p \leq 0.001$. Table 1. Demographic Characteristics of Participants

Table 2. Comparison of the Group's Pre-Test and Post-Test Values for the DASS-21 Score

The standard deviation and mean values of the pre-test and post-test are shown in Table 2. On comparison of mean values of the DASS-21 score of the pre-test (25.55 ± 6.23) and post-test (13.77 ± 3.10), the calculated t value demonstrated that the mean values of the pre- and post-tests showed a statistically significant difference (12.19) at $p \leq 0.001$. When comparing the post-test data to the pre-test values, an improvement was seen in the participants.

Table 1. Demographic Characteristics of Participants

Variables	N	Minimum	Maximum	Mean	Std Deviation	Skewness	
-						Statistic	Std Error
Age	30	20.00	22.00	21.11	0.697	0.154	0.448
Height	30	140.00	184.00	158.48	10.12	1.02	0.481
Weight	30	52.00	109.00	71.27	13.90	1.09	0.315
BMI	30	25.00	44.80	28.30	4.68	2.17	0.441

Table 2. Comparison of the Group's Pre-Test and Post-Test Values for the DASS-21 Score

Group	Pre-Test		Post-Test		Lower CI	Upper CI	SEM	t Test	df	Significance
-	Mean	SD	Mean	SD	-					
Groups	25.55	6.23	13.77	3.10	9.78	13.76	0.968	12.19	29	0.000***

Discussion

According to Khir et al. (2024), the effectiveness of progressive muscle relaxation (PMR) in relieving tension and anxiety, as well as alleviating stress in adults, is comprehensively reviewed in this paper's literature. The outcome measurements demonstrate that PMR significantly reduces overall stress, anxiety, and depression in adults.¹⁷ The combined techniques of PMR and other therapies also consistently showed greater effectiveness, especially for stress (n = 10) than anxiety (n = 9). Progressive Muscle Relaxation (PMR) has been demonstrated in 24 trials to be beneficial in reducing stress and anxiety in 21 studies and depression in 11 studies, either when used alone or in combination with other therapies.

According to Magnon et al. (2021), a stress management program was implemented that taught in vitro fertilization (IVF) applicants coping mechanisms, relaxation techniques, and psychoeducation. It was hypothesized that deep and slow breathing (DSB) would lower both groups' reported levels of anxiety and physiological stress markers.¹⁸ They discovered that compared to women in the control group, the women who received the intervention experienced a decrease in anxiety after the intervention. The study found no significant impact on pregnancy rates, which may be related to younger persons' greater susceptibility to stress. As anticipated, following just five minutes of DSB exercise, both young and older persons' subjective anxiety greatly diminished. Additionally, following DSB, physiological stress decreased as well, as seen by a considerable rise in HF power in both older and younger persons.

A study by Pawlow and Jones demonstrated that JMR significantly lowered cortisol levels and self-reported stress in participants.¹⁹ Similarly, deep breathing exercises have been shown to activate the parasympathetic nervous system, leading to reduced heart rate and blood pressure, and subsequently, lower stress levels.²⁰ These findings suggest

that both techniques can be beneficial for physiotherapy students who often experience high stress due to academic and clinical demands.

Limitations of the Study

- The sample size was less.
- The study had a shorter duration.
- The study population was final-year physiotherapy students only.
- The age category was limited.
- This study did not conduct a follow-up assessment.

Future Recommendations

- The sample size can be larger.
- The study can be done for a longer duration.

Conclusion

The study concluded that the implementation of deep breathing exercises along with Jacobson's muscle relaxation technique causes a reduction in stress among people.

Source of Funding: None

Conflict of Interest: None

References

1. Deng Y, Cherian J, Khan NU, Kumari K, Sial MS, Comite U, Gavurova B, Popp J. Family and academic stress and their impact on students' depression level and academic performance. *Front Psychiatry*. 2022;13:869337. [PubMed] [Google Scholar]
2. Ovsianikova Y, Pokhilko D, Kerdyvar V, Krasnokutsky M, Kosolapov O. Peculiarities of the impact of stress on physical and psychological health. *Multidiscip Sci J*. 2024 May 7;6:e2024ss0711. [Google Scholar]
3. Prasad RS, Sasikala P. Factors influencing stress in teaching profession. *Forum Linguistic Stud*. 2024;6(1):666-84.

4. Liu J, Liu Y, Ma W, Tong Y, Zheng J. Temporal and spatial trend analysis of all-cause depression burden based on Global Burden of Disease (GBD) 2019 study. *Sci Rep.* 2024 May 29;14(1):12346. [PubMed] [Google Scholar]
5. Boothroyd S, Chou F, Black T, Liu S. Youth mental health in the digital age: Canadian youth perspectives on the relationship between digital technology and their mental health. *J Child Adolesc Couns.* 2024 Jun 20;10(2):145-64. [Google Scholar]
6. Sikandar BJ, Kavitha K. Prevalence of psychosocial problems and their risk factors among school-going middle adolescents: an exploratory study. *Indian J Psychiatr Nurs.* 2024 Jan 1;21(1):2-9. [Google Scholar]
7. Zuo X, Zhao L, Li Y, He W, Yu C, Wang Z. Psychological mechanisms of English academic stress and academic burnout: the mediating role of rumination and moderating effect of neuroticism. *Front Psychol.* 2024 Jan 24;15:1309210. [PubMed] [Google Scholar]
8. Bautista MA, Buatag E, Dumdim I, Ramada JC, Selomandin AA. Examining the impact of family structure on stress levels among students: a quantitative analysis. *Excellencia Int Multidisc J Educ.* 2024;2(1):317-38. [Google Scholar] Peyer KL, Hathaway ED, Doyle K. Gender differences in stress, resilience, and physical activity during the COVID-19 pandemic. *J Am Coll Health.* 2024 Feb 12;72(2):598-605. [PubMed] [Google Scholar]
9. Mariotti A. The effects of chronic stress on health: new insights into the molecular mechanisms of brain-body communication. *Future Sci OA.* 2015;1(3):FSO23. [PubMed] [Google Scholar]
10. Hamdani SU, Zill-E-Huma, Zafar SW, Suleman N, Um-Ul-Baneen, Waqas A, Rahman A. Effectiveness of relaxation techniques 'as an active ingredient of psychological interventions' to reduce distress, anxiety and depression in adolescents: a systematic review and meta-analysis. *Int J Ment Health Syst.* 2022;16(1):31. [PubMed] [Google Scholar]
11. Toussaint L, Nguyen QA, Roettger C, Dixon K, Offenbacher M, Kohls N, Hirsch J, Sirois F. Effectiveness of progressive muscle relaxation, deep breathing, and guided imagery in promoting psychological and physiological states of relaxation. *Evid Based Complement Alternat Med.* 2021;2021:5924040. [PubMed] [Google Scholar]
12. Norelli SK, Long A, Krepps JM. Relaxation techniques [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan [cited 2024 May 25]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK513238/> [PubMed] [Google Scholar]
13. Pezirkianidis C, Karakasidou E, Lakioti A, Stalikas A, Galanakis M. Psychometric properties of the Depression, Anxiety, Stress Scales-21 (DASS-21) in a Greek sample. *Psychology.* 2018;9(15):2933-50. [Google Scholar]
14. Dhaniwala NK, Dasari V, Dhaniwala MN. Pranayama and breathing exercises-types and its role in disease prevention & rehabilitation. *J Evol Med Dent Sci.* 2020;9(44):3325-30. [Google Scholar]
15. Mushtaq B, Khan AA. Jacobson muscle relaxation technique (Jpmr) (20 min). *JOJ Nurse Health Care.* 2018;8(1):555726. [Google Scholar]
16. Khir SM, Yunus WM, Mahmud N, Wang R, Panatik SA, Sukor MS, Nordin NA. Efficacy of progressive muscle relaxation in adults for stress, anxiety, and depression: a systematic review. *Psychol Res Behav Manag.* 2024;17:345-65. [PubMed] [Google Scholar]
17. Magnon V, Dutheil F, Vallet GT. Benefits from one session of deep and slow breathing on vagal tone and anxiety in young and older adults. *Sci Rep.* 2021;11(1):19267. [PubMed] [Google Scholar]
18. Pawlow LA, Jones GE. The impact of abbreviated progressive muscle relaxation on salivary cortisol. *Biol Psychol.* 2002;60(1):1-16. [PubMed] [Google Scholar]
19. Jerath R, Edry JW, Barnes VA, Jerath V. Physiology of long pranayamic breathing: neural respiratory elements may provide a mechanism that explains how slow deep breathing shifts the autonomic nervous system. *Med Hypotheses.* 2006;67(3):566-71. [PubMed] [Google Scholar]